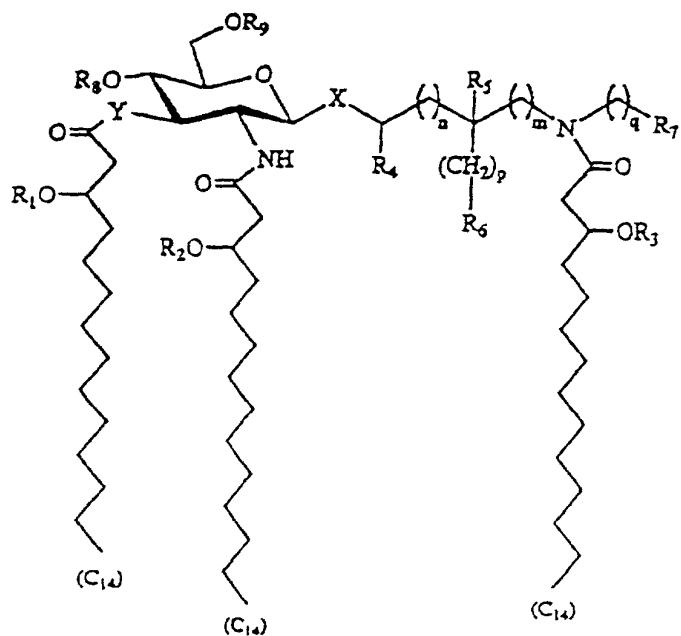


Claims

1. An immunoefector compound having the following structure:



wherein, X is selected from the group consisting of O and S at the axial or equatorial position; Y is selected from the group consisting of O and NH; n, m, p and q are integers from 0 to 6; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are the same or different and are normal fatty acyl residues having from 1 to about 20 carbon atoms and where one of R<sub>1</sub>, R<sub>2</sub> or R<sub>3</sub> is optionally hydrogen; R<sub>4</sub> and R<sub>5</sub> are the same or different and are selected from the group consisting of H and methyl; R<sub>6</sub> and R<sub>7</sub> are the same or different and are selected from the group consisting of H, hydroxy, alkoxy, phosphono, phosphonoxy, sulfo, sulfoxy, amino, mercapto, cyano, nitro, formyl and carboxy, and esters and amides thereof; and R<sub>8</sub> and R<sub>9</sub> are the same or different and are selected from the group consisting of phosphono and H, and at least one of R<sub>8</sub> and R<sub>9</sub> is phosphono.

2. The compound of claim 1, wherein R<sub>6</sub> is carboxy.

3. The compound of claim 2, wherein X is O; Y is O; n, m, p and q are 0; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are normal fatty acyl residues having 10 carbon atoms; R<sub>4</sub>, R<sub>5</sub> and R<sub>7</sub> are H; R<sub>8</sub> is phosphono; R<sub>9</sub> is H; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each attached to a stereogenic center having an *R* configuration; and R<sub>5</sub> is attached to a stereogenic center having an *S* configuration.

4. The compound of claim 2, wherein X is O; Y is O; n, m, p and q are 0; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are normal fatty acyl residues having 12 carbon atoms; R<sub>4</sub>, R<sub>5</sub> and R<sub>7</sub> are H; R<sub>8</sub> is phosphono; R<sub>9</sub> is H; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each attached to a stereogenic center having an *R* configuration; and R<sub>5</sub> is attached to a stereogenic center having an *S* configuration.

5. The compound of claim 2, wherein X is O; Y is O; n, m, p and q are 0; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are normal fatty acyl residues having 10 carbon atoms; R<sub>4</sub>, R<sub>5</sub> and R<sub>7</sub> are H; R<sub>8</sub> is phosphono; R<sub>9</sub> is H; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each attached to a stereogenic center having an *R* configuration; and R<sub>5</sub> is attached to a stereogenic center having an *R* configuration.

6. The compound of claim 2, wherein X is O; Y is O; n, m, p and q are 0; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are normal fatty acyl residues having 8 carbon atoms; R<sub>4</sub>, R<sub>5</sub> and R<sub>7</sub> are H; R<sub>8</sub> is phosphono; R<sub>9</sub> is H; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each attached to a stereogenic center having an *R* configuration; and R<sub>5</sub> is attached to a stereogenic center having an *S* configuration.

7. The compound of claim 1, wherein R<sub>6</sub> is H.

8. The compound of claim 7, wherein X is O; Y is O; n is 2; m, p and q are 0; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are normal fatty acyl residues having 14 carbon atoms; R<sub>4</sub>, R<sub>5</sub> and R<sub>7</sub> are H; R<sub>8</sub> is phosphono; R<sub>9</sub> is H; and R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each attached to a stereogenic center having an *R* configuration.

9. The compound of claim 7, wherein X is O; Y is O; n is 1, m and p are 0; q is 1; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are normal fatty acyl residues having 10 carbon atoms; R<sub>4</sub> and R<sub>5</sub> are

H; R<sub>7</sub> is carboxy; R<sub>8</sub> is phosphono; R<sub>9</sub> is H; and R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each attached to a stereogenic center having an *R* configuration.

10. The compound of claim 7, wherein X is O; Y is O; m, n, p and q are 0; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are normal fatty acyl residues having 14 carbon atoms; R<sub>4</sub>, R<sub>5</sub> and R<sub>7</sub> are H; R<sub>8</sub> is phosphono; R<sub>9</sub> is H; and R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each attached to a stereogenic center having an *R* configuration.

11. The compound of claim 7, wherein X is O; Y is O; m, n, p and q are 0; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are normal fatty acyl residues having 10 carbon atoms; R<sub>4</sub>, R<sub>5</sub> and R<sub>7</sub> are H; R<sub>8</sub> is phosphono; R<sub>9</sub> is H; and R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each attached to a stereogenic center having an *R* configuration.

12. The compound of claim 7, wherein X is O; Y is O; m, p and q are 0; n is 1; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are normal fatty acyl residues having 14 carbons; R<sub>4</sub>, R<sub>5</sub> and R<sub>7</sub> are H; R<sub>8</sub> is phosphono; R<sub>9</sub> is H; and R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each attached to a stereogenic center having an *R* configuration.

13. The compound of claim 1, wherein R<sub>6</sub> is hydroxy.

14. The compound of claim 13, wherein X is O; Y is O; m, n and q are 0; p is 1; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are normal fatty acyl residues having 12 carbon atoms; R<sub>4</sub> and R<sub>5</sub> are H; R<sub>7</sub> is H; R<sub>8</sub> is phosphono; and R<sub>9</sub> is H; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each attached to a stereogenic center having an *R* configuration; and R<sub>5</sub> is attached to a stereogenic center having an *S* configuration.

15. The compound of claim 13, wherein X is O; Y is O; m and q are 0; n and p are 1; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are normal fatty acyl residues having 10 carbon atoms; R<sub>4</sub>, R<sub>5</sub> and R<sub>7</sub> are H; R<sub>8</sub> is phosphono; R<sub>9</sub> is H; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each attached to a stereogenic center

having an *R* configuration; and R<sub>5</sub> is attached to a stereogenic center having an *S* configuration.

16. The compound of claim 13, wherein X is O; Y is O; m, n and q are 0; p is 2; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are normal fatty acyl residues having 10 carbon atoms; R<sub>4</sub>, R<sub>5</sub> and R<sub>7</sub> are H; R<sub>8</sub> is phosphono; R<sub>9</sub> is H; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each attached to a stereogenic center having an *R* configuration; and R<sub>5</sub> is attached to a stereogenic center having an *S* configuration.

17. The compound of claim 13, wherein X is O; Y is O; m, n and q are 0; p is 1; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are normal fatty acyl residues having 14 carbon atoms; R<sub>4</sub>, R<sub>5</sub> and R<sub>7</sub> are H; R<sub>8</sub> is phosphono; R<sub>9</sub> is H; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each attached to a stereogenic center having an *R* configuration; and R<sub>5</sub> is attached to a stereogenic center having an *R* configuration.

18. The compound of claim 13, wherein X is O; Y is O; m, n and q are 0; p is 1; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are normal fatty acyl residues having 14 carbon atoms; R<sub>4</sub>, R<sub>5</sub> and R<sub>7</sub> are H; R<sub>8</sub> is phosphono; R<sub>9</sub> is H; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each attached to a stereogenic center having an *R* configuration; and R<sub>5</sub> is attached to a stereogenic center having an *S* configuration.

19. The compound of claim 13, wherein X is O; Y is O; m, n and q are 0; p is 1; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are normal fatty acyl residues having 11 carbon atoms; R<sub>4</sub>, R<sub>5</sub> and R<sub>7</sub> are H; R<sub>8</sub> is phosphono; R<sub>9</sub> is H; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each attached to a stereogenic center having an *R* configuration; and R<sub>5</sub> is attached to a stereogenic center having an *S* configuration.

20. The compound of claim 13, wherein X is O; Y is O; m, n and q are 0; p is 1; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are normal fatty acyl residues having 10 carbon atoms; R<sub>4</sub>, R<sub>5</sub> and R<sub>7</sub> are H; R<sub>8</sub> is phosphono; R<sub>9</sub> is H; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each attached to a stereogenic center having an *R* configuration; and R<sub>5</sub> is attached to a stereogenic center having an *S* configuration.

21. The compound of claim 1, wherein X is O; Y is O; m, n, p and q are 0; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are normal fatty acyl residues having 10 carbon atoms; R<sub>4</sub> and R<sub>5</sub> are H; R<sub>6</sub> is

amino carbonyl; R<sub>7</sub> is H; R<sub>8</sub> is phosphono; and R<sub>9</sub> is H; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are each attached to a stereogenic center having an *R* configuration; and R<sub>5</sub> is attached to a stereogenic center having an *S* configuration.

22. The compound of claim 1, wherein R<sub>1</sub> is hydrogen.
23. The compound of claim 1, wherein R<sub>2</sub> is hydrogen.
24. The compound of claim 1, wherein R<sub>3</sub> is hydrogen.
25. A method for enhancing the immune response of a mammal comprising administering to the mammal an effective amount of a compound of claim 1.
26. A vaccine composition comprising a compound of claim 1, an antigen and a suitable carrier.
27. A pharmaceutical composition comprising a compound of claim 1 and a pharmaceutically acceptable carrier.
28. The composition of claim 27, wherein said pharmaceutically acceptable carrier is an aqueous composition comprising water and one or more surfactants selected from the group consisting of glycodeoxycholate, deoxycholate, sphingomyelin, sphingosine, phosphatidylcholine, 1,2-Dimyristoyl-sn-glycero-3-phosphoethanolamine, L- $\alpha$ -Phosphatidylethanolamine, and 1,2-Dipalmitoyl-sn-glycero-3-phosphocholine, or a mixture thereof.
29. The composition of claim 28, wherein said one or more surfactant is 1,2-Dipalmitoyl-sn-glycero-3-phosphocholine.

30. The composition of claim 28, wherein the molar ratio of said compound to surfactant is from about 10:1 to about 1:25.

31. The composition of claim 28, wherein the molar ratio of said compound to surfactant is from about 4:1 to about 1:9.

32. The composition of claim 27, wherein said carrier is a stable emulsion comprising a metabolizable oil, one or more surfactants, an antioxidant and a component to make the emulsion isotonic.

33. The composition of claim 32, wherein said stable emulsion comprises 1-10% v/v squalene, 0.9% w/v PLURONIC-F68 block co-polymer, 1.9% w/v egg phosphatidyl choline, 1.75% v/v glycerol and 0.05% w/v  $\alpha$  tocopherol.

34. The composition of claim 27 wherein said carrier is a suspension comprising aluminum hydroxide, calcium hydroxide, calcium phosphate or tyrosine adsorbate.

35. The composition of claim 27 wherein said carrier is an aqueous solution or aqueous micellar dispersion comprising triethylamine or triethanolamine.

36. The composition of claim 27 wherein said carrier comprises microspheres or microparticles, and the compound of claim 1 is within the matrix of the microspheres or microparticles or adsorbed thereon.